

NATURAL RESOURCES CONSERVATION SERVICE  
CONSERVATION PRACTICE STANDARD

## ROOF RUNOFF STRUCTURE

**New York**  
(number)  
code NY558

### DEFINITION

Structures that collect, control, and transport precipitation from roofs.

### PURPOSES

This practice may be applied as a part of a resource management system to support one or more of the following purposes:

- Improve water quality
- Reduce soil erosion
- Increase infiltration
- Protect Structures
- Increase water quantity

### CONDITIONS WHERE PRACTICE APPLIES

This practice applies where:

- Roof runoff structures are a component of an overall resource management system;
- Roof runoff needs to be diverted away from structures or contaminated areas
- There is a need to collect, control, and transport runoff from roofs to a stable outlet
- Roof runoff is collected and used for other purposes

### CRITERIA

#### General Criteria Applicable to All Purposes

**Roofs:** Roof water may be excluded by installing one, or a combination of the following components:

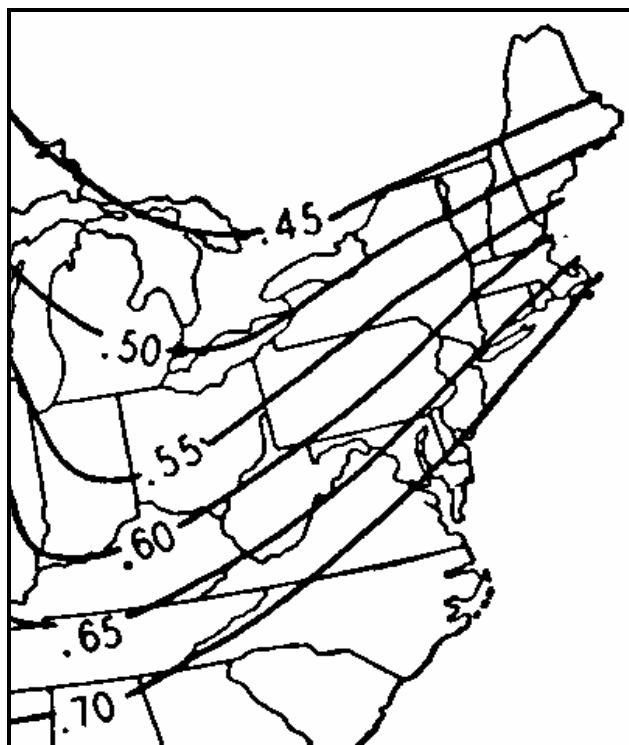
1. *Roof gutters* where gutters can be installed to withstand snow and ice.
2. *Drip trenches* that collect water at the fall line and safely carry discharge through surface flow; Surface Drain (607); or subsurface flow; Subsurface Drain (606). Drip trench components shall be designed and installed in accordance

with the appropriate conservation standard. These trenches must be bermed or curbed to contain the clean water and fenced where needed to eliminate animal access.

**Design Capacity:** At a minimum, a 10-year frequency, 5 minute rainfall precipitation event shall be used to design of roof runoff structures, except where excluding roof runoff from manure management systems. In that case, a 25-year frequency, 5 minute precipitation event shall be used. Rainfall from Figure 1 and discharge rates from Table 1 or reliable local records may be used for design.

**FIGURE 1**

Twenty-five year frequency,  
five minute rainfall (inches)



**TABLE 1**

Five Minute Rainfall (inches)	Peak Discharge (cfs/1, 000 sq. ft.)*
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0.40	0.11
0.45	0.12
0.50	0.14
0.55	0.15
0.60	0.17
0.65	0.18
0.70	0.19

\* discharge based on rational formula

**System Capacity:** System capacity may be limited by:

1. capacity of the gutters, or
2. capacity of the downspouts.

The slope and dimensions of gutters and the size, number, and location of down spouts will be selected to provide the minimum design capacity at all points in the system.

**Materials:** Roof runoff structures shall be made of durable materials with a minimum design life of 10 years. Roof gutters and downspouts may be made of aluminum, galvanized steel, wood, or plastic. Aluminum gutters and downspouts shall have a nominal thickness of at least 0.027 inches and 0.020 inches respectively.

Galvanized steel gutters and downspouts shall be at least 28 gage. Wood shall be clear and free from knots. A water-repellent preservative shall be applied to the flow area of wood other than redwood, cedar, or cypress. Plastics shall contain ultraviolet stabilizers. Dissimilar metals shall not be in contact with each other.

Rock-filled trenches and pads shall consist of poorly graded rock (all rock fragments approximately the same size) and be free of appreciable amounts of sand and/or soil particles. Crushed limestone shall not be used for backfill material unless it has been washed. Subsurface drains or outlets shall meet the material requirements of the applicable NRCS conservation practice standard.

Concrete appurtenances used shall meet the requirements of NRCS Construction Specification 32, Concrete for Minor Structures.

**Gutters and Supports:** Gutter supports shall have sufficient strength to withstand anticipated water, snow, and ice loads. Gutters shall be installed with the outer edge a minimum of 0.5 inches below the projection of the roof line to reduce gutter damage from snow and ice.

Gutters will have a continuous backing support

with vertical face unless otherwise specified by the manufacturer. Expansion joints shall be used on straight runs of forty feet or more.

Supports will be hangers installed according to manufacturer's recommendations and have a maximum spacing of 48 inches for galvanized steel and 32 inches for aluminum and plastic, except that a maximum spacing of 24 inches should be provided when heavy ice loading is anticipated. The hanger supports shall provide for a free-floating system for expansion and contraction with temperature.

Wood gutters shall be mounted on fascia boards using furring blocks that are a maximum of 24 inches apart.

**Downspouts:** Downspouts located in livestock areas will be protected from damage with vertical sections of heavy metal pipe or with other protective measures.

Orifices for downspouts, on standard 5 inch "k" gutters, shall be located to drain no greater than:

1. 0.092 cfs per 2 inch x 3 inch downspout, or
2. 0.184 cfs per 3 inch x 4 inch downspout, or
3. 0.018 cfs per 1 square inch of orifice.

Downspouts shall be securely fastened at the top and bottom with intermediate supports that are a maximum of 10 feet apart.

**Outlets:** The water from roof runoff structures may empty into surface drains or underground outlets, or onto the ground surface. When downspouts empty onto the ground surface, there shall be an elbow to direct water away from building foundations and splash blocks or other protection shall be provided to prevent erosion. Surface and underground outlets carrying roof runoff shall be sized to carry adequate design capacity, provide for cleanout as appropriate, and be located so they will not pick up and transport contaminants. Existing and proposed foundation drains shall not be used as a roof runoff outlet unless designed to handle both the flows and debris.

**Protection:** Roof runoff structures and outlets shall be protected from damage by livestock and equipment. Where appropriate, snow and ice guards may be installed on roofs to protect gutters and reduce the hazard to humans and

animals below.

**Erosion and Sediment Control:** An erosion and sediment control plan shall be developed for all disturbed areas. For disturbed areas greater than one acre, the erosion and sediment control plan shall meet the planning, installation, and maintenance requirements of NYS Pollutant Discharge Elimination System General Permit for Storm water Discharges. All Erosion and sediment structures and measures shall be installed prior to earth disturbing activities unless otherwise directed in the construction drawings.

#### **Additional Criteria to Increase Infiltration**

Runoff shall be routed onto pervious landscaped areas (e.g., lawns, mass planting areas, infiltration trenches, natural areas) to increase infiltration of runoff. These areas shall be capable of infiltrating the runoff in such a way that replenishes soil moisture without adversely affecting the desired plant species.

#### **Additional Criteria to Protect Structures**

Runoff shall be directed away from structure foundations to avoid wetness and hydraulic loading on the foundation.

On expansive soils or bedrock, downspout extensions shall be used to discharge runoff a minimum of 5 feet from the structure.

The discharge area for runoff must slope away from the protected structure.

#### **Additional Criteria to Increase Water Quantity**

Structures needed to collect and store water from roofs for potable and non-potable purposes shall be designed and installed in accordance with sound engineering principles. Storage structures for non-potable purposes such as irrigation water should be designed in accordance with NRCS conservation practice standards, as appropriate.

Potable storage structures should be constructed of materials and in a manner that will not increase the contamination of the stored water. Roof water collected and stored for potable uses must be treated prior to consumption and should be tested periodically

to assure that adequate quality is maintained for human consumption.

### **CONSIDERATIONS**

Avoid discharging outlets near wells or into structures that discharge directly into surface waters.

### **PLANS AND SPECIFICATIONS**

Plans and specifications for installing a roof runoff structure shall be in keeping with this standard and shall describe the requirement for applying the practice to achieve its intended purpose.

The plans and specifications shall show the location, spacing, size, and grade of all gutter and downspouts and type and quality of material to be used. Plans and specifications for other practices essential to the proper functioning of the roof runoff structure, such as underground outlet, shall be included.

### **OPERATION AND MAINTENANCE**

An operation and maintenance plan shall be developed that is consistent with the purposes of the practice, intended life, safety requirements, and the criteria of the design. The plan shall contain but not be limited to:

- A requirement for inspections periodically and after major storms and melts
- Repair broken or weakened components, including fences and drip trench berms
- Clean out debris that has collected in the system

Erosion and sediment control structures will be maintained periodically and after every major runoff event until the disturbed area is fully protected.

### **REFERENCES**

**NRCS Agricultural Waste Management Field Handbook**, NEH Part 651, Appendix 10B

**New York Standards and Specifications for Erosion and Sediment Control** (blue book)